

# **FACTORS AFFECTING DELAYS ON PRIVATE CONSTRUCTION PROJECTS**

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## **ABSTRACT**

*Construction Delays is a major of concern in the private projects construction industry in Jordan. With the fact that construction delays are nothing but loss of time and money such study was conducted to identify the factors that causes the construction delays. Therefore three groups consist of consultants, contractors and owners were questioned, Shortage of manpower (skilled, semiskilled, unskilled labor), Delay in the approval of contractor submissions by the engineer, Shortage of materials, The relationship between different subcontractors' schedules were the most important factors that cause delays in private projects sector in Jordan. Furthermore one way ANOVA analysis conducted to select factors that share agreement between the three groups.*

**Key words:** Construction Delays; Construction Projects; Jordanian Construction Sector.

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## **1. INTRODUCTION**

In construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as common problem in construction projects. To the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases and maybe lost opportunities for new projects because of diminished financial capabilities (Assaf and Al-Hejji 2006).

The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment. To the dislike of all the participants (owners, contractors, and

consultants), however, many projects experience extensive delays and thereby exceed initial time and cost estimates (Odeh and Battaineh, 2002).

Recently, the Jordanian construction industry has been undergoing a boom (Sweis et al., 2008). A huge number of large-scale private projects are currently under construction or in the planning and contract-awarding phase. Therefore understanding the causes of delays and their importance is a major concern in order to minimize and avoid the delays and their corresponding expenses in the field of private projects construction industry in Jordan. The main objectives of this study include the following:

- To identify the causes of delays in private projects construction in Jordan.
- To identify the importance of each delay cause in private projects construction in Jordan.
- To study the differences in perceptions of the three major parties in any constructions: (consultants, contractors, and owners).

## 2. LITERATURE REVIEW

Many studies were conducted on the causes of delays in construction projects in different developing countries, including Middle East. Several articles have discussed causes of delay in construction projects in numerous manners. Some studies identified the main causes of delay in several countries and various project types, while other studies discussed the delay analysis methods and the proposed ways to mitigate it.

Kumaraswamy Moha and Chan Daniel (1998) in their study provides pointers to appropriate strategies and particular measures that may be adopted to avoid and/or mitigate project delays by focusing on the direct and indirect common contributors to same, such as delays in design information and productivity levels. To them, the main reasons behind projects delays in Hong Kong are: unforeseen ground conditions, poor site management and supervision, low speed in decision making involving all project teams, client-initiated variations, necessary variations of works, Inadequate contractor experience. Investigating the causes and effects of delays facing in the Malaysian construction industry Sambasivan Murali and Soon Yau Wen (2007) found that the most important delay factors are: contractor's improper planning, contractor's poor site management, inadequate contractor experience, inadequate client's finance and payments for completed work, problems with subcontractors. Frimpong Yaw et al. (2003) in their study identifies and examines the causes of delay and cost overruns in the construction of groundwater projects in Ghana. The results of this study were that the reasons behind the delays are respectively: poor contractor management, monthly payment difficulties from agencies, material procurement, poor technical performances, and escalation of material prices according to their degree of influence. The major sources of delays on highrise building construction projects in Thailand are identified by Ogunlana Stephen and Promkuntong Krit (1996): shortage of construction materials, shortage of site workers, incomplete drawings by designers, materials management problems by contractors, deficiencies in organization. Kalib Chabota et al. (2009) in their study about schedule delays in road construction in Zambia found that the most important causes of delays are: delayed payment, protracted financial processes in client organization, financial difficulties, contract modification, and economic hardships. Kaming Peter et al. (1997) studied about time and cost overruns in high-rise construction in Indonesia. The results of this study were that the major causes of time overruns are: design changes, inadequate planning,

inaccuracy of materials estimating, poor labor productivity, inaccurate prediction of craftsmen production rate.

Toor Shamas-Ur-Rehman and Ogunlana Stephen (2008) studied the Problems causing delays in major construction projects in Thailand. The findings showed that most problems related to designers, clients, contractors and finance were rated among the top problems; whereas a multicultural and multilingual environment, large numbers of project participants and the involvement of foreign designers were perceived as not very significant problems.

Many studies have been conducted in the same manner in the region of the middle east. Koushki et al. (2005) studied the problems experienced during the construction of private residences in the state of Kuwait. The results of the study were that the main reasons that cause the delays in the construction of private residential projects in Kuwait are: the number of change orders, financial constraints, and owners' lack of experience in construction, material-related problems, and weather related problems. In Egypt, Marzouk Mohamed (2008) in their study highlighted the importance and the effect of each of the causes of delays and focused upon the most important causes. The causes are included the delay in receiving design documents, delay in the preparation process due to lack of (resources, experience, and management), unforeseen conditions, mistakes/changes in the design documents provided by the employer, delay in responding to contractor's queries. In Egypt also, Abd El-Razek et al. (2008) in their studied the actual causes of delay that affect building projects in Egypt in order to minimize and avoid the delays and their corresponding expenses. The results of this study were that the major delay causes in building projects in Egypt are respectively: financing by contractor during construction, delays in contractor's payment by owner, design changes by owner or his agent during construction, partial payments during construction, non utilization of professional construction/contractual management. Assaf Sadi and Al-Hejji Sadiq (2006) in their study identified the causes of delays in construction in Eastern Province of Saudi Arabia. They found that the major delay causes in large construction projects are: change orders by owner during construction, delay in progress payments, ineffective planning and scheduling by contractor, poor site management and supervision by contractor, difficulties in financing by contractor. Another study in Saudi Arabia done by Al-Kharashi and Skitmore (2009) stated that, in the case where the project is a public building or facility, the complications increase as the client is a government department. Then the main reasons that causes the delays in construction projects in Saudi Arabian public sector are: delay in progress payments by the owner, non-payment of the contractor claim, lack of finance to complete the work by the client, late in revising and approving design documents by owner, delay in approving sample materials by owner.

Faridi and El-Sayegh (2006) in their study identified the most significant causes of delay in the UAE construction industry to be able to find ways to avoid them, or at least, mitigate their impact. The results of this study were that the critical factors that causes the delays in the UAE construction industry are respectively: preparation and approval of drawings, inadequate early planning of the project, slowness of the owner's decision-making process, shortage of manpower, poor supervision and poor site management. On the other hand, Zaneldin (2006) identified several problem areas in the construction process in UAE. The causes by this study are: delayed payments, protracted financial processes in client organizations, financial difficulties that

accompany the delayed release of funds by client organizations, contract modification, and economic hardships.

In Jordan, less attention have been paid. Odeh and Battaineh (2002) in their study -in which the objective of it was to identify the major causes of delay in the construction industry and to assess the relative importance of these causes for the traditional adversarial type of contracts from the viewpoint of construction contractors and consultants. The results of their study were that the most important factors of delay according to the contractor are respectively: Labor productivity, Owner interference, and inadequate contractor experience. While the factors of delay according to the consultant are: Inadequate contractor experience, Finance and payments of completed work, and Subcontractors. Sweis et al. (2008) in their study stated that delays in construction projects are common in the Jordanian construction industry and that the most important reasons behind the construction delays in Jordan are respectively: financial difficulties faced by the contractor, too many change orders from owner, poor planning and scheduling of the project by the contractor, presence of unskilled labor, shortage of technical professionals in the contractor's organization.

### **3. METHODOLOGY**

Based on the results of all the reviewed studies, specially the Jordanian ones, we develop a list of factors, which might affect the delays in the Jordanian private projects and categorized them into three main groups. A questionnaire was developed in order to evaluate the frequency of occurrence and importance of the identified causes. The design of the questionnaire has been based on Assaf and Al-Hejji (2006) and Sweis (2008) references, and the study questionnaire is based on Open Conversion System proposed by Drewin. According to Drewin the construction process influenced by technologies and both external and internal environments. Therefore, a combination between Drewin's open conversion system and delay causes identified in previous studies results in 45 potential delay factors were summarized into three major categories:

Production Elements (PE) includes: Labor (L), Materials (M) and Equipment (E) related factors.

Internal Environment (IE) includes: Consultant, Contractor and Owner related factors.

External Environment (EE) includes: Weather, Government Regulations and Other reasons

The consultants, contractors, and owners of an accomplished sixty projects in year 2014, with a cost more than 1.3 million dollars were targeted. Then the questionnaire was distributed by hand. Therefore a sample consists of 60 consultants, 60 contractors, and 35 owners selected (many residential and trade buildings have the same owner- organization). Responses to the questionnaire were then collected and analyzed. The responses consisted of 50 consultants, 50 contractors, and 20 owners. They were asked to grade each delay cause from a scale of 1 to 5 in which number 5 indicates a very strong affecting cause on the construction projects and number 1 indicates a minor cause of delays in the construction projects.

### **4. DATA ANALYSIS AND RESULTS**

The delay causes was ranked by taking the average of the respondents for each individual group/participant (consultant, contractor, owner), then the average of the three groups was calculated separately. The resulting averages were ranked in

descending order according to the highest average in the group response. The ranks are presented in tables 4.1, 4.2 and 4.3 respectively.

**Table 4.1** Reasons' Ranking for Consultant

REASON	CATEGORY	SUB CATEGORY	Avg. rate
Shortage of manpower (skilled, semiskilled, unskilled labor)	Productive elements	Labor ( L )	3.5
Too many change orders from owner	Internal Environment (IE)	Owner	3.4
Delays in contractor's payment by owner	Internal Environment (IE)	Owner	3.3
Insufficient coordination among the parties by the contractor	Internal Environment (IE)	Contractor	3.3
Shortage of equipments	Productive elements	Equipments ( E )	3.3
Slowness of the owner decision making process	Internal Environment (IE)	Owner	3.3
Financing by owner during construction	Internal Environment (IE)	Contractor	3.2
Shortage of materials	Productive elements	Materials ( M )	3.2
Delay in the approval of contractor submissions by the engineer	Internal Environment (IE)	Consultant / Designer	3.1
Preparation and waiting for approval of shop drawings and material samples	Internal Environment (IE)	Consultant / Designer	3.1
Delays in contractor's payments to subcontractors	Internal Environment (IE)	Contractor	3.1
Delay in materials delivery	Productive elements	Materials ( M )	3.1
Labor productivity	Productive elements	Labor ( L )	3.1
Poor planning and scheduling of the project by the contractor	Internal Environment (IE)	Contractor	3.0
The relationship between different subcontractors' schedules	Internal Environment (IE)	Contractor	3.0
Shortage of technical professionals in the contractor's organization	Internal Environment (IE)	Contractor	3.0
Insufficient equipments	Productive elements	Equipments ( E )	3.0
Shortage in labor	Productive elements	Labor ( L )	3.0
Severe weather conditions on the job site	External Environment	Weather	2.9
Mistakes in soil investigation	Internal Environment (IE)	Consultant / Designer	2.9
Unexpected foundation conditions encountered in the field	Internal Environment (IE)	Consultant / Designer	2.9
Slow response by the consultant engineer regarding testing and inspection	Internal Environment (IE)	Consultant / Designer	2.9
Financing by contractor during construction	Internal Environment (IE)	Owner	2.9
Over-design increasing the overall cost	Internal Environment (IE)	Consultant / Designer	2.7
Failure to utilize tools to manage the project symmetrically	Internal Environment (IE)	Owner	2.7
Delays in site preparation	Internal Environment (IE)	Owner	2.7
Unrealistic project schedule	Internal Environment (IE)	Contractor	2.7
Poor leadership on part of the sub-contractors	Internal Environment (IE)	Contractor	2.7
Poor communication with the suppliers	Internal Environment (IE)	Contractor	2.7
Use of unacceptable construction techniques by the contractor	Internal Environment (IE)	Contractor	2.7
Failure of equipments	Productive elements	Equipments ( E )	2.7

## Factors Affecting Delays on Private Construction Projects

REASON	Category	Sub Category	Avg. rate
Changes in materials types and specifications during construction	Productive elements	Materials ( M )	2.7
Improper technical study by the contractor during the bidding stage	Internal Environment (IE)	Contractor	2.6
Difficulties in obtaining work permits	External Environment	Government Regulations	2.6
Improper project feasibility study	Internal Environment (IE)	Consultant / Designer	2.6
Lack of communication with consultant / owner	Internal Environment (IE)	Contractor	2.6
Poorly written contracts	Internal Environment (IE)	Consultant / Designer	2.5
Lack of database in estimating activity duration and resources	Internal Environment (IE)	Contractor	2.5
Delay in mobilization	Internal Environment (IE)	Contractor	2.5
Changes in government regulations and laws	External Environment	Government Regulations	2.4
Using obsolete technology	Internal Environment (IE)	Contractor	2.4
Accidents during construction	External Environment	Other	2.2
Large number of participants of project implementation	Internal Environment (IE)	Contractor	2.2
Safety rules and regulations aren't followed within the contractors organization	Internal Environment (IE)	Contractor	2.0
Problem with neighbors	External Environment	Other	1.8

**Table 4, 2 Reason Ranking for Contractor**

REASON	Category	Sub Category	Avg. rate
Shortage of manpower (skilled, semiskilled, unskilled labor)	Productive elements	Labor ( L )	3.6
Delay in the approval of contractor submissions by the engineer	Internal Environment (IE)	Consultant / Designer	3.4
Difficulties in obtaining work permits	External Environment	Government Regulations	3.3
Slowness of the owner decision making process	Internal Environment (IE)	Owner	3.3
Too many change orders from owner	Internal Environment (IE)	Owner	3.3
Preparation and waiting for approval of shop drawings and material samples	Internal Environment (IE)	Consultant / Designer	3.3
Shortage of equipments	Productive elements	Equipments ( E )	3.3
Shortage of materials	Productive elements	Materials ( M )	3.3
Labor productivity	Productive elements	Labor ( L )	3.3
Shortage in labor	Productive elements	Labor ( L )	3.2
Financing by owner during construction	Internal Environment (IE)	Contractor	3.1
Poor leadership on part of the sub-contractors	Internal Environment (IE)	Contractor	3.1
Delay in materials delivery	Productive elements	Materials ( M )	3.1
Improper technical study by the contractor during the bidding stage	Internal Environment (IE)	Contractor	3.0
Slow response by the consultant engineer regarding testing and inspection	Internal Environment (IE)	Consultant / Designer	3.0
Financing by contractor during construction	Internal Environment (IE)	Owner	3.0
Insufficient coordination among the parties by the contractor	Internal Environment (IE)	Contractor	3.0
Shortage of technical professionals in the	Internal Environment (IE)	Contractor	3.0

REASON	Category	Sub Category	Avg. rate
contractor's organization			
Failure of equipments	Productive elements	Equipments ( E )	3.0
Unexpected foundation conditions encountered in the field	Internal Environment (IE)	Consultant / Designer	2.9
Delays in contractor's payments to subcontractors	Internal Environment (IE)	Contractor	2.9
Use of unacceptable construction techniques by the contractor	Internal Environment (IE)	Contractor	2.9
Insufficient equipments	Productive elements	Equipments ( E )	2.9
Delays in contractor's payment by owner	Internal Environment (IE)	Owner	2.8
Over-design increasing the overall cost	Internal Environment (IE)	Consultant / Designer	2.8
Poor planning and scheduling of the project by the contractor	Internal Environment (IE)	Contractor	2.8
Delay in mobilization	Internal Environment (IE)	Contractor	2.8
Changes in materials types and specifications during construction	Productive elements	Materials ( M )	2.8
Changes in government regulations and laws	External Environment	Government Regulations	2.7
Severe weather conditions on the job site	External Environment	Weather	2.7
Unrealistic project schedule	Internal Environment (IE)	Contractor	2.7
The relationship between different subcontractors' schedules	Internal Environment (IE)	Contractor	2.7
Lack of database in estimating activity duration and resources	Internal Environment (IE)	Contractor	2.7
Delays in site preparation	Internal Environment (IE)	Owner	2.6
Poorly written contracts	Internal Environment (IE)	Consultant / Designer	2.6
Improper project feasibility study	Internal Environment (IE)	Consultant / Designer	2.6
Mistakes in soil investigation	Internal Environment (IE)	Consultant / Designer	2.6
Large number of participants of project implementation	Internal Environment (IE)	Contractor	2.6
Lack of communication with consultant / owner	Internal Environment (IE)	Contractor	2.6
Safely rules and regulations aren't followed within the contractors organization	Internal Environment (IE)	Contractor	2.6
Poor communication with the suppliers	Internal Environment (IE)	Contractor	2.4
Problem with neighbors	External Environment	Other	2.4
Failure to utilize tools to manage the project symmetrically	Internal Environment (IE)	Owner	2.4
Using obsolete technology	Internal Environment (IE)	Contractor	2.4
Accidents during construction	External Environment	Other	2.3

**Table 4.3** Reason's Ranking for Owner

REASON	Category	Sub Category	Avg. rate
Shortage of materials	Productive elements	Materials ( M )	3.3
The relationship between different subcontractors' schedules	Internal Environment (IE)	Contractor	3.3
Over-design increasing the overall cost	Internal Environment (IE)	Consultant / Designer	3.2
Delay in the approval of contractor submissions by the engineer	Internal Environment (IE)	Consultant / Designer	3.1
Preparation and waiting for approval of shop	Internal Environment (IE)	Consultant / Designer	3.1

## Factors Affecting Delays on Private Construction Projects

REASON	Category	Sub Category	Avg. rate
drawings and material samples			
Slowness of the owner decision making process	Internal Environment (IE)	Owner	3.0
Insufficient coordination among the parties by the contractor	Internal Environment (IE)	Contractor	3.0
Financing by owner during construction	Internal Environment (IE)	Owner	2.9
Too many change orders from owner	Internal Environment (IE)	Owner	2.9
Slow response by the consultant engineer regarding testing and inspection	Internal Environment (IE)	Consultant / Designer	2.9
Large number of participants of project implementation	Internal Environment (IE)	Contractor	2.9
Shortage of manpower (skilled, semiskilled, unskilled labor)	Productive elements	Labor ( L )	2.8
Poorly written contracts	Internal Environment (IE)	Consultant / Designer	2.8
Unexpected foundation conditions encountered in the field	Internal Environment (IE)	Consultant / Designer	2.8
Poor communication with the suppliers	Internal Environment (IE)	Contractor	2.8
Labor productivity	Productive elements	Labor ( L )	2.8
Shortage in labor	Productive elements	Labor ( L )	2.7
Delays in contractor's payment by owner	Internal Environment (IE)	Owner	2.7
Lack of database in estimating activity duration and resources	Internal Environment (IE)	Contractor	2.7
Use of unacceptable construction techniques by the contractor	Internal Environment (IE)	Contractor	2.7
Delay in mobilization	Internal Environment (IE)	Contractor	2.6
Difficulties in obtaining work permits	External Environment	Government Regulations	2.6
Severe weather conditions on the job site	External Environment	Weather	2.6
Improper technical study by the contractor during the bidding stage	Internal Environment (IE)	Contractor	2.6
Failure of equipments	Productive elements	Equipments ( E )	2.6
Changes in materials types and specifications during construction	Productive elements	Materials ( M )	2.5
Delay in materials delivery	Productive elements	Materials ( M )	2.5
Shortage of technical professionals in the contractor's organization	Internal Environment (IE)	Contractor	2.5
Insufficient equipments	Productive elements	Equipments ( E )	2.4
Failure to utilize tools to manage the project symmetrically	Internal Environment (IE)	Owner	2.4
Poor leadership on part of the sub-contractors	Internal Environment (IE)	Contractor	2.4
Financing by contractor during construction	Internal Environment (IE)	Contractor	2.4
Poor planning and scheduling of the project by the contractor	Internal Environment (IE)	Contractor	2.3
Changes in government regulations and laws	External Environment	Government Regulations	2.3
Delays in site preparation	Internal Environment (IE)	Owner	2.3
Improper project feasibility study	Internal Environment (IE)	Consultant / Designer	2.3
Safely rules and regulations aren't followed within the contractors organization	Internal Environment (IE)	Contractor	2.3
Shortage of equipments	Productive elements	Equipments ( E )	2.3
Mistakes in soil investigation	Internal Environment (IE)	Consultant / Designer	2.2

REASON	Category	Sub Category	Avg. rate
Using obsolete technology	Internal Environment (IE)	Contractor	2.2
Lack of communication with consultant / owner	Internal Environment (IE)	Contractor	2.2
Delays in contractor's payments to subcontractors	Internal Environment (IE)	Contractor	2.1
Problem with neighbors	External Environment	Other	2.0
Unrealistic project schedule	Internal Environment (IE)	Contractor	2.0
Accidents during construction	External Environment	Other	1.9

We notice that the Shortage of man power (skilled, semiskilled, unskilled) were considered to be the first and the most frequent causes of delay in private projects in Jordan from the view point of the consultants and contractors and it's the first according to the average of the three groups. For the owner, the shortage of materials was the most frequent cause, and it was one of the most important four causes for the three groups.

The Jordanian construction industry suffers from the shortage of skilled man power because of the high wages demanded by the skilled foreign man power, and that is why the contractor depends on cheap, unskilled labor.

Delay in the approval of contractor submissions by the engineer and that's a very important factor that the contractor complains from, and it's the second most important reason in the contractor points of view. In general the contractor can't start any work or finish it without the approval of the engineer, so in general that process delays the project. In some cases we notice that in some contracts the engineer got a specific time to give the approval to the contractor (24 hours as an example) and that's cause a lot of delay in the project because the contractor can't work before getting that approval. And in some other cases the contractor starts his work without the engineer approval and in that case the engineer has the right to make the contractor does that work again.

Shortage of materials is the third most frequent cause according to the point of view of the contractor consultant and owner and it's the most frequent reason among the owners point of view. And the critical importance of this cause might come from a sudden increase in the cost of materials, and that might be a result of the increasing in demand on a specific material, monopoly of a specific material or import and export problems, so it's hard to get the enough quantity of that material.

The relationship between different subcontractors' schedules was one of the most important delay causes according to the average of the three groups .The critical importance of this cause can be seen clearly by noticing that one of the most important delay causes by the consultant was "Insufficient coordination among the parties by the contractor", and by the owner was " The relationship between different subcontractors' schedules ". Therefore both consultant and owner are blaming the contractor for his poor project implementation, coordination and planning. In addition, there is a strong agreement among the respondents on some of the lowest causes which are: "Accidents during construction", "Problem with neighbors "and" Changes in government regulations and laws".

A one-way analysis of variance ANOVA was conducted among the means of responses from the three groups to check for any significant differences among the groups perceptions regarding the importance of the various delay causes.

The mean values under the three groups, F statistics, and the P values at which hypothesis of equality of mean values across different groups could be rejected were calculated .

The tabular critical F value at the 0.05 level for 2° and 117° degree of freedom is approximately (3.074).

From the analysis, it was found that there were statistically non-significant differences among the respondent groups over the following sample of causes:

- Shortage in labor ( $F = 1.65$ ,  $P = 0.196$ )
- Labor productivity ( $F = 1.93$ ,  $P = 0.15$ )
- Shortage of materials ( $F = 0.08$ ,  $P = 0.923$ )
- Delay in materials delivery ( $F = 2.27$ ,  $P = 0.108$ )
- Changes in materials types and specifications during construction. ( $F = 0.4$ ,  $P = 0.674$ )

The following causes have the highest F values which indicate a very strong agreement between the respondents from the three groups over the following sample of causes:

- Shortage of manpower (skilled, semiskilled, unskilled labor), ( $F = 3.33$ ,  $P = 0.039$ )
- Shortage of equipments ( $F = 5.96$ ,  $P = 0.003$ )
- Safely rules and regulations aren't followed within the contractors organization ( $F = 4.47$ ,  $P = 0.013$ )
- Delays in contractor's payments to subcontractors. ( $F = 5.81$ ,  $P = 0.004$ )
- Large number of participants of project implementation. ( $F = 3.73$ ,  $P = 0.027$ )

## 5. CONCLUSIONS AND RECOMMENDATIONS

The stated objective of this paper is to identify the causes of delay that produce the greatest effects and the extent to which these effects can be ameliorated in the private construction industry in Jordan. A literature review was conducted to identify the causes of delay stipulated in the literature.

The importance index of each cause is calculated as an average of the frequency indices of each cause. 45 causes of delay were identified through research. The identified causes are combined into three categories. The field survey included 50 consultants, 50 contractors, and 20 owners. Data then collected were analyzed by frequency and importance.

However, the result of this study indicated that Shortage of manpower (skilled, semiskilled, unskilled labor), Delay in the approval of contractor submissions by the engineer, Shortage of materials and the relationship between different subcontractors' schedules are the major causes of delays in private projects in Jordan.

Owners specified that causes of delay are related to consultant and contractor; the consultants specified that the causes of delay are related to the contractor and the owners, and the contractors specified that the causes of delay are related to the consultants and owners, so we notice that each party of the project is blaming the other two parties.

In general, two of the three parties (Consultant and Contractor) had an agreement over the most important cause which is Shortage of manpower (skilled, semiskilled, unskilled labor), and there was an agreement between two parties on the other top ranked causes.

All parties agree that the following causes are the least important: accidents during construction and problems with neighbors.

The following points can be recommended by all parties in order to minimize and control delays in construction projects:

**Consultants** should look to the following points:

- Avoid delay in reviewing and approving design documents.
- Avoid the delay in giving the approval for the contractor to proceed the work.

**Contractors** should consider the following factors:

- Shortage and low productivity of labor: enough number of labors should be assigned and be motivated to improve productivity.
- Do some more coordination between subcontractors' schedules.
- Avoid insufficient coordination among the parties by the contractor.
- Financial and cash flow problems: contractor should manage his financial resources and plan cash flow by utilizing progress payment.

**Owners** should give special attention to the following factors:

- Avoid too many changes in orders in the project after the bidding period.
- Be faster in his decision making so he won't delay the project.
- Avoid the delay in payments for each of the contractor and consultant.
- Check for resources and capabilities, before awarding the contract to the lowest bidder.

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